

Charles University in Prague

Faculty of Social Sciences
Institute of Economic Studies



BACHELOR THESIS

**The Commercial Real Estate Analysis for
CEECs Region**

Author: **Michal Pavlas**

Supervisor: **PhDr. Michal Hlaváček, Ph.D.**

Academic Year: **2012/2013**

Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

The author grants to Charles University permission to reproduce and to distribute copies of this thesis document in whole or in part.

Prague, May 16, 2013

Signature

Acknowledgments

The author is very grateful to PhDr. Michal Hlaváček, Ph.D. for supervising this thesis and providing him with useful suggestions and corrections of the content.

Bachelor Thesis Proposal

Charles University in Prague
Faculty of Social Sciences
Institute of Economical Studies

Author: Michal Pavlas
Supervisor: PhDr. Michal Hlaváček, Ph.D.
Specialization: Economic Theory
Defense Planned: June 2013

Proposed topic:

The Commercial Real Estate Analysis for CEECs Region

Preliminary outline:

Commercial price developments are very significant for situation on industry market in every country, because almost 10 % of employees are involved in real-estate business. In nineties came a large boom of real estate market all over the Central and Eastern Europe, because large investments mainly from Western-European companies were finally allowed from governments. Suddenly whole new market was established. This work is going to explain the behavior of commercial real estate prices in twelve large Central- and Eastern-European cities and their close surroundings in last ten years. Author would like to focus on office, retail and industrial buildings and would like to find out what determines the prices of commercial real estate. According to author's knowledge, no other work on commercial real estate analysis for CEECs region was ever written before.

In the first part, we describe the current situation and characteristics of the real estate market in each chosen city and in whole CEECs region. In the second part, author would like to build models using panel data and

time series analysis. These models should allow us to study the behavior of prices under the parameters we choose. After doing this, author is going to comment and interpret the results and perhaps suggest future development of commercial real estate prices.

Bibliography:

Égert, B. and Mihaljek, D., 2007: *Determinants of House Prices in Central and Eastern Europe*. Bank for International Settlements, BIS Working Papers 236.

Greene, W. H., 2003, *Econometric Analysis*, 5th edition, Prentice Hall, New Jersey.

Hilbers, P. L. C., Lei, Q., Zacho, L., 2001. *Real Estate Market Developments and Financial Sector Soundness*. International Monetary Fund, IMF Working Paper 01/129.

Hlaváček, M. and L. Komárek, 2009. Regional Analysis of Housing Price Bubbles and their Determinants in the Czech republic. *Czech Journal of Economic and Finance*, 61(7), pp. 67-91.

Wooldridge, J. M., 2009. *Introductory econometrics: a modern approach*, MIT Press, Cambridge, Massachusetts, second edition 2009.

Bibliographic record

PAVLAS, Michal. *The Commercial Real Estate Analysis for CEECs Region*. Praha, 2013. 62 s. Bakalářská práce (Bc.), Univerzita Karlova, Fakulta sociálních věd, Institut ekonomických studií. Vedoucí bakalářské práce PhDr. Michal Hlaváček, Ph.D.

Number of characters: 62 033

Abstract

In this thesis we examine macroeconomic factors that influenced the office real estate market in CEE countries between years 2000 and 2012. First, we describe commercial real estate indicators. Next, we create several models for four cities - Prague, Budapest, Moscow and Istanbul. We make also panel data regression for all four cities. We conclude some key determinants that influence the prime yields of office buildings in each city and finally we compare and contrast the results across all cities.

Our results suggest that prime yields are most influenced by vacancy rate, gross take-up, total office stock and unemployment rate.

Keywords Commercial real estate, prime yields, vacancy rate, prime rents

Author's e-mail m.pavlas@seznam.cz

Supervisor's e-mail michal.hlavacek@cnb.cz

Abstrakt

V této práci zkoumáme makroekonomické faktory, které ovlivňovaly trh kancelářských nemovitostí v zemích střední a východní Evropy mezi lety 2000 a 2012. Nejprve popíšeme veličiny komerčních nemovitostí. Později vytvoříme několik modelů pro čtyři města - Prahu, Budapešť, Moskvu a Istanbul. Vytvoříme také panelovou regresi pro všechna čtyři města. Najdeme několik klíčových determinantů, které ovlivňují výnosy z kancelářských budov v každém městě a nakonec je porovnáme mezi sebou.

Naše výsledky poukazují na to, že výnosy jsou nejvíce ovlivněny mírou neobsazenosti, hrubým objemem pronájmů, celkovým objemem kancelářských ploch a mírou nezaměstnanosti.

Klíčová slova Komerční nemovitosti, výnosy a nájem z nejlepších nemovitostí, míra neobsazenosti

E-mail autora m.pavlas@seznam.cz

E-mail vedoucího práce michal.hlavacek@cnb.cz

Contents

List of Figures.....	i
List of Tables.....	i
Acronyms.....	ii
1 Introduction.....	1
2 Structure of the thesis.....	3
3 Contemporary research.....	5
4 Real estate indicators.....	10
4.1 Data description.....	11
5 Choice of the cities.....	16
5.1 Prague.....	16
5.2 Budapest.....	19
5.3 Moscow.....	21
5.4 Istanbul.....	22
6 Methodology.....	25
6.1 Data issues.....	25
6.2 Time-series.....	27
6.3 Panel data.....	28
7 Results and interpretation.....	29
7.1 Prague.....	29
7.2 Budapest.....	32
7.3 Moscow.....	34
7.4 Istanbul.....	34
7.5 Panel Data.....	37
8 Comparison of the cities.....	37
9 Conclusion.....	46
10 Bibliography.....	48
11 Appendix.....	I

List of Figures

Figure 6. 1.: New supply, gross take-up and net absorption in Prague, 2000-2012 (m ²).....	26
Figure 6. 2.: Prime yields and 10 years bond yields, 2000-2012 (%)	27
Figure 8. 1.: Prime yields in Prague, Budapest, Moscow and Istanbul, 2000-2012 (%).....	39
Figure 8. 2.: Total office stock in Prague, Budapest, Moscow and Istanbul per 1.000 inhabitants, 2000-2012(m ²)	41
Figure 8. 3.: Gross take-up in Prague, Budapest, Moscow and Istanbul, 2000-2012(m ²)	42
Figure 8. 4.: Vacancy rate in Prague, Budapest, Moscow and Istanbul, 2000-2012(%).....	43
Figure 8. 5.: Prime rents in Prague, Budapest and Moscow, 2000-2012 (EUR/month.m ²)	44
Figure 8. 6: Unemployment rate in Prague, Budapest, Istanbul and Moscow, 2000-2012 (%)..	45

List of Tables

Table 1: Prague.....	29
Table 2: Budapest.....	32
Table 3: Moscow.....	34
Table 4: Istanbul	35
Table 5: Panel data regression.....	37
Table 6: Comparison	38
Table 7: DW statistics (original).....	I
Table 8: KPSS	I
Table 9: Dickey - Fuller test	I
Table 10: Breusch-Pagan test.....	I
Table 11: Hausman test.....	II

Acronyms

CNB	Czech National Bank
CPI	Consumer price index
DW	Durbin-Watson statistic
EU	European Union
EUR	Euro
Eurostat	European Statistical Office
GDP	Gross domestic product
OLS	Ordinary least squares
REIT	Real estate investment trust
VAR	Vector autoregression
VECM	Vector error correction model

1 Introduction

The real estate and the construction are typical and important part of a civil engineering. Even though residential real estate is usually considered as more important segment for a development of an economy, commercial real estate plays also a significant role. Nowadays, the construction business is running very low, managers have to deal with high vacancy rate, lack of tenants and a mistrust from bankers. In these days, it is more important than ever before to decide what type of commercial property should developers build and where. To achieve this goal, developers must know what determines the price of square meter in office building, what influences the vacancy rate and if there is a demand for commercial real estate at all. Are prices and yields only influenced by the location? Or there are many other important factors like GDP, interest rate and so on?

There were some studies conducted on this subject, but mostly were dealing either with Western European market or the market in the USA. But there is a minimum of publications that concern the market in Central and Eastern Europe. In our study we would like to examine and analyze what are the determinants of the office sector of commercial property in big cities in the CEE region.

We will describe commercial real estate markets in Prague, Budapest, Moscow and Istanbul, we will talk about their recent developments and also about projects that are planned to be built soon. We will use data from global real estate agency - Jones Lang LaSalle - and make models that should help us to find out what influences the yields of office buildings.

In the end, we should be able to identify the specifications of each market and be able to decide what determines the prices of commercial real estate.

2 Structure of the thesis

In the first part, we would like to talk about current state of research. Unfortunately, the research in this area is very rare, especially the one concerning Central and Eastern Europe. These articles should help us understand specifications of real estate market in general and a way of doing business in the CEE region. We will be then able to see which determinants are important and how they influence each other.

Further on, we will describe theoretical background of our paper. Firstly, the data will be explained - the way we collected them, their specifications and limitations. We will try to figure out what determines decision-making of developers and real estate agents. Commercial real estate is often divided into four segments - office, logistics, retail and hotels. We are going to pick just one segment of commercial real estate - office - because of a limitation either from data collection or a length of this paper.

We chose Prague, Istanbul, Budapest and Moscow as city for our analysis. In this part, we will discuss the reasons why we did that. We will also state few reports and facts concerning the office market in the cities that will summarize us current situations, impacts of global financial crisis, modern trends in construction and the biggest troubles developers are dealing with nowadays.

Next part describes the methodology. In the beginning of this section, the data issues will be covered and tested - for stationarity, heteroskedasticity and autocorrelation. We will then express our expectations about the model and state more details and technical issues about achieving the model. We will also state more details about the methodology we use.

In the final part, we will construct a time-series model for each major city in the CEE region and in the end a panel data model for whole commercial

real estate market in Central and Eastern Europe. Finally and most importantly, we will discuss the results of each model. Our goal is to find out what influences the prime yields of office buildings. We will be mostly interested in a demand side of the problem. But since the demand should be equal to a supply, we will be able to figure out what influences basically whole office market. After discussing the results of each city, we will compare and contrast the results among themselves.

In conclusion, we will summarize the results and discuss whether our previous statements or commonly believed facts correspond to reality.

3 Contemporary research

Lieser and Groh (2011) found in their paper basic determinants of commercial property. They created a set of panel data for 47 countries worldwide. Data covered the period from 2000 to 2009 and had 66 categories. They tested six key drivers on commercial real estate investment. First category is economic activity which is compound from economic size, GDP per capita, real GDP growth, unemployment rate etc. Many of those factors proved to be significant, so we will try to use them in our analysis. Next category is real estate investment opportunities. To this category, many indexes can be counted, such as degree of urban population, quality of road, air and rail network, telecommunications and others. Also many of these explanatory variables were statistically significant. But their usage is definitely more complicated in our case because of many reasons - problems with good collecting of the data in developing countries, asymmetry of values throughout the country (we are interested only in cities and their close surroundings) and nonexistence of the data itself in many countries. Lieser and Groh added depth and sophistication of capital markets category to their model. Total trading volume, ease of access to loans, soundness of banks were for example used in the model. Those variables did not actually explain the model very precisely so we chose not to take them to our considerations. Other two categories (investor protection and legal framework and administrative burdens and regulatory limitations) were really difficult to calculate and to acquire the data, so we also decided to omit them and we will not use them in our analysis. Last category is called socio-cultural and political environment. Crime, bribery, government effectiveness variables belong to this category and it sounds actually as a solid reason to use them in analysis, but they unfortunately proved to be insignificant in the most

cases. Still, we believe that at least some of them can be useful for our purposes.

Stephen Lee (2005) wrote a paper about investment potential of international real estate markets. His paper explains very precisely what causes mainly American, British and German investor to move their business rather east. Returns from office property can be zero on one side of the world and can reach values over ten percent somewhere else (Pagliari, 1997). In the period 1985 – 1995, US office market provided almost zero average annual return, but similar investment in the UK, Australia and Canada were able to earn return 12,4%, 8,1% and 4,5% respectively. In other words, investors are extending their business all over the world to minimize their portfolio risk. And because of such behavior, we can now analyze fast-growing segment of office property in the CEE region. Webb and O'Keefe (2002) confirms this hypothesis by suggesting that there is only 14 countries in the world which has real estate market big enough to provide an investor sufficient number of investing opportunities to minimize the risk of their portfolios. Developers, who do not run business in those 14 countries, have no other choice than to invest on international scale. Although this attitude lowers risks in general, it also brings new ones to the business. If we stay in Eastern Europe, every single country is unique, despite the common socialistic history. The specifications of every market bring new, yet unexplored, risks that cannot be overlooked. According to Lee (2005), investor must take three issues in account: the potential of the countries in general, the potential of the individual market sectors within the country and the investment process itself (direct, joint venture etc.). Lee (2002 and 2005) created a list of 51 countries that arranged countries to 5 groups according to REP index, which is simply based on 4 criteria - expected growth, country risk,

transparency and market specific risk. Not surprisingly, mostly of countries from Central and Eastern Europe placed in the last two groups. Lee (2005) concludes in his paper that investors are slowly but surely moving overseas, the removal of barriers to entry makes it easier and the development of legal and professional infrastructure makes it possible.

Higgins (2000) wrote possibly the most important theoretical paper. First of all, Higgins summarized all the research on Australian market concerning real estate analysis and forecasts to the year 2000 and questioned the correctness of the results made by academics. From his point of view, the results suffer from insufficient accuracy because of the spurious correlations and stationarity. He also criticizes the usage of national data and suggests using local transactional databases that are more likely to reveal true behavioral performance.

Case, Goetzmann and Rouwenhorst (2000) conducted a study which proves a dependence of property returns to both global and local GDP growth. Global GDP can very good explain changes in property returns, but mostly country-specific GDP changes explain more of the variation. "Our study suggests that, while real estate is fundamentally local, demand for space apparently responds to contemporaneous changes in the global economy." (Case, Goetzmann and Rouwenhorst, 2000). This statement also confirms that portfolio volatility can be reduced by cross-border property investment. From that, we can easily conclude that property returns across the globe are more or less correlated. Quan and Titman (1998) in addition added and confirmed relationship with stock returns. We would like to follow them up and add GDP growth and stock returns as variables to our model.

It is believed that residential and commercial real estate have many features in common. So why do we study them separately? Gyourko (2009)

showed that correlation between housing and commercial appreciation rates is nearly 40 %¹. Both sectors also have similar trend in time. So should we use variable concerning housing or not? Well, in short run both categories seem to behave in the same manner. But they do not do so in the long run. Gyourko (2009) explains this problem by saying that co-movement is based on the similar prize of the land. Due to broader demand and smaller transaction costs, housing prices tend to be more volatile than commercial ones. Gyourko argues that the biggest (and perhaps the most significant) difference between residential and commercial real estate are REITs². REITS are (fortunately for our purposes) not so common in the Europe yet, so we do not have to take REITs into consideration. Another important difference is a huge risk aversion by people buying houses and almost risk neutrality of investors speculating on the commercial real estate. Despite this fact, we still believe that some of the variables, that are valid for the residential market, can be used for our regression.

Only effort in analyzing the CEE real estate market has been done by European Central Bank in its Financial Stability Review. These reviews are regularly published every six months from December 2004. In the reports, we can find out the latest development of both residential and commercial real estate in general. These papers are unfortunately not very useful for this thesis. Financial Stability Reviews report mostly about old members of EU (Germany, France, Belgium etc.) and give relatively small space to new members who would be interesting for us. Moreover, two cities which we

¹ Gyourko showed this relationship on US market. We make here big assumption that similar relationship can be seen also in Eastern Europe, which we cannot support by any academic writing.

² Real Estate Investment Trust is a security that sells like a stock on the major exchanges and invests in real estate directly, either through properties or mortgages. REITs receive special tax considerations and typically offer investors high yields, as well as a highly liquid method of investing in real estate. (Investopedia.com)

used (Istanbul and Moscow) are not situated in countries from European Union.

Implications for our thesis

We found a lot of useful information in papers concerning commercial real estate. We can divide them in two categories - information about methodology and about explanatory variables we can use. We learned that time-series analysis can be done by OLS, VAR or VECM estimators. Every method has its advantages and disadvantages. We also learned that panel data regression was made with random effect model. Explanation of what we chose and why will be given in the methodology part. Perhaps, information about the variables was more interesting. It is naturally recommended to use data from commercial real estate agents. Also relations to GDP, interest rates and unemployment rate were studied and confirmed therefore we will use some financial and labor statistics too. Finally, some correlation between residential and commercial real estate has been proved. That is why we will also try to add some residential statistics to our regression.

4 Real estate indicators

The real estate investors and developers are making their financial decisions on the basis of market analysis. Those market analyses are done by many real estate agencies almost everywhere, but only four of them are located in every major city (Jones Lang LaSalle, CBRE, Cushman & Wakefield and Colliers International), are truly global and are able to collect data correctly. We chose data source Jones Lang LaSalle because it was possible to us to acquire their data and because they have more than 20 years experience in post-soviet republics.

We would like to explain more thoroughly now why we chose the office segment from whole commercial real estate business. First of all, data of office segment are the longest. We were usually able to obtain data from year 2000. The data to logistics and retail are being collected for a shorter time. Hotel segment was not taken in account because the data and the information are very limited and specific. Both hotel and retail segment would be difficult to compare across the countries because they are affected by local trends and traditions and an existence of tourist monuments and attractions. Logistic segment does not show any of these limitations. On the other hand, logistics does not play so significant role on real estate market due to its small extent. To summarize it, office real estate is easily comparable across countries, has sufficiently long data that are collected in the same way (because of the globally valid standards of Jones Lang LaSalle) and is commonly taken as the most important part of commercial real estate.

4.1 Data description

We made our own dataset which contains data from several sources. Main source is global real estate agency Jones Lang LaSalle. This source provided us with many important real estate data such as: prime yields, gross take-up etc. We will comment on every category later on. Other sources are country statistical offices (for example Czech Statistical Office, Turkish Statistical Institute, Russian Federation Federal State Statistics Office and so on) and Eurostat. These offices provided us with many mainly macroeconomic indicators - unemployment rate, CPI, GDP per capita - and also with a few indicators concerning residential housing - index of construction output, gross take-up of the flats. Most of the data can be acquired in a quarterly form. Unfortunately, much information for residential real estate is collected only on a yearly basis which made it more complicated for us. We will discuss how we handle this issue in the methodology part.

The data from state statistical offices are publicly available, there is no problem to acquire them. Definitely more trouble were obtaining of the data from real estate agencies. Although they publish their reports quarterly on their company website, they keep them there only for several months. That makes almost impossible to acquire older data from them without their help. Even after we finally obtain their dataset, the amount of data is not satisfactory. The reason is that the local real estate offices interested in commercial real estate came to the post-soviet states no sooner than in mid nineties. That practically means, we can acquire data only after year 2000, which leave us approximately 50 observations for each city (the situation is often even worse in the cities that are situated in less developed countries).

Now, we will describe some of the data. We will talk about their availability, what they mean and what role should they play in the model.

Prime yields - source: Jones Lang LaSalle. Prime yields tell us basically how profitable it is to construct an office building in certain place and time. We can easily calculate its value as a fraction of yearly lease payment and its whole construction cost. Prime yields are always stated as a percent. The final value is calculated as a weighted average of all buildings on a certain real-estate market. If we reverse this amount, we get a number of years after which the building will be repaid. It is clear that higher prime yields bring the investors better profits.

The prime yields are usually available on quarterly frequency. If we somehow fail to obtain quarterly data and acquire only yearly data instead, we use Cubic Spline Interpolation³. This method was originally constructed for interpolating quarterly data to monthly ones. According to our findings, nothing prevents us to use this method for interpolating yearly data to quarterly.

Prime rents - source: Jones Lang LaSalle. Prime rents represent the best quality open market rents that can be acquired in the office building that is built in the highest quality and is located on the best address in the city. Normally, prime rents are calculated only from units over 500 square meters of lettable floorspace. That means premium units with a small quantity of space are excluded. Prime rents are published without service charges (typically about 10 % of prime rents) and local taxes (depends specifically on the country where the office is built). Real estate agencies often publish also rents in another part of the city - suburbs, industrial zones, airport etc. These values are very specific and tend to depend only on subjective reasons. Moreover, these rents cannot be compared throughout the cities in the Eastern Europe because of lack of the

³ <http://columbiaeconomics.com/2010/01/20/how-economists-convert-quarterly-data-into-monthly-cubic-spline-interpolation/> (4.4.2013)

information on every single location. Therefore we decided not to use them in our analysis, we will use only prime rents. The prime rents are typically published quarterly which is sufficient for our purposes. The problem can be that prime rents tend to be stable over time which practically means that we acquire many same values in our data sheet. That can arise few problems which we will have to solve in data analysis.

Vacancy rate - source: Jones Lang LaSalle. Vacancy rate represents immediate vacant office floorspace (including sub-lettings) in all completed buildings on the market. It is always expressed as a percentage of the total stock. The vacancy rate nicely indicates whether the real estate market is filled up or not. It basically shows what the demand for commercial real estate spaces is. This is one of the most important statistics for real estate developers. If they see that vacancy rate is less than 10 percentage points, they tend to invest in the country. Vacancy rate is from our point of view good indicator of real-estate bubbles or possibly crisis. If the rate starts to rocket upwards unexpectedly, it is a clear sign that real estate sector is going to burst. The vacancy rate is supposed to be negatively correlated with the prime yields. If the vacancy rate is high, many of the commercial units are not leased. This causes yearly income from rents to decrease and therefore the prime yields will decrease too.

Gross take-up - source: Jones Lang LaSalle. The gross take-up represents floorspace acquired on the market during the survey period (usually three months). The unit is counted as taken-up when a legally-binding contract is signed. This statistics includes both leased and sold spaces but also includes the pre-lettings of floorspace during the construction or even before. The gross take-up is very useful when we want to investigate whether the market is booming or whether it is currently in crisis. We can observe that gross take-up reached values over 100 000 square meters per

three-month period (in Budapest, Prague) between the year 2005 and 2008 and after 2008 gross take-up significantly decreased almost to zero. The worst year was 2011 where take-up was at 10 percent level comparing to year 2008. Nowadays the situation got little better, so it can be a sign of a new growth in real estate market. When the market is in the crisis, the growth of gross take-up is driven mostly by renegotiations. It would be more convenient to use net take-up from which renegotiations are subtracted. Unfortunately, data to net take-up are not published by real estate agencies. The gross take-up should also be very significant variable when we want to investigate prime yields. We suppose that they should move in the same direction as prime yields because the take-up increases rents and therefore also prime yields.

Total stock - source: Jones Lang LaSalle. The total stock is a simple characteristic that shows us how many square meters is available on the market of both rented and unrented floorspace. This basically shows the supply of new or reconstructed office building on the market. We are worried about strong positive correlation between the gross take-up and the total stock, which we will have to test. On the other side, the gross take-up does not necessary have to keep the same pace as the total stock. In the ideal case, where there is a zero vacancy rate, those two statistics would surely correlate. But we (fortunately for our purposes) do not live in ideal world where whole supply is consumed. That means when no new building is finished, still some floorspace can be leased due to nonzero vacancy rate and pre-lettings contracts.

Net absorption - source: Jones Lang LaSalle. Net absorption is defined as a difference between the square meters of companies that moved-in and expanded and the companies that moved-out or decreased their rented space in the same period (JonesLang LaSalle, Q3 2011). This is relatively

new statistics. We have succeeded to obtain data of net absorption only in Prague. Net absorption is also equal to gross take-up subtracted of renegotiations and pre-leases.

We will also use data like CPI, GDP per capita, unemployment rate or yields of 10 treasury year bonds. These data are collected monthly except GDP per capita. We only make them quarterly by making an average of three consecutive months which gives us quarterly value. GDP per capita is an inflation-adjusted measure that reflects the value of all goods and services produced in a given year, expressed in base-year prices divided by number of citizens. Yield of the bond is simply the income return of the investment which is expressed annually as a percentage of its face value. Unemployment rate is the percentage of the total labor force that is unemployed but actively seeking employment and willing to work. CPI (consumer price index) measures changes in the price level of a market basket of consumer goods and services purchased by households.

5 Choice of the cities

In this section, we would like to give more detailed set of information about each city we chose for are our analysis. We will give a brief description of the city, its population and location. Further on, we will discuss its importance in the country and specify why we chose that city and finally we will talk about real-estate market in general and its commercial part more thoroughly. That means we will discuss its recent development, the way how it handles the situation coming from so-called world financial crisis and our forecast for future development.

We chose there four cities - Prague, Budapest, Istanbul and Moscow - because we believe that these cities make a good sample of the cities in the CEE countries. All determine the development of real estate in their countries. Prague and Budapest describes the real estate market in relatively developed countries, Moscow presents the market in fast-growing economy and Istanbul represents an Islamic country and its way of running a real estate business.

5.1 Prague

5.1.1 Brief description

Prague is the capital and the largest city of the Czech Republic. It is situated on the Vltava River and in the middle of the Czech Republic. It has about 1.3 million inhabitants and its larger urban zone is supposed to have over 2 million people. Prague is the sixth most visited city in the Europe. Prague is comparable to Berlin, Rome or Houston according to GaWC⁴.

5.1.2 Importance for the country

Prague has always been the most important financial and political city in the Czech Republic. It has an excellent location within the country which

⁴ Globalization and World Cities Research Network: <http://www.lboro.ac.uk/gawc/>

enables Prague to become a supplier centre. Therefore there is also the biggest international airport. Because of its dominant position in the Czech Republic, foreign investor firstly invested their money here in Prague. Unfortunately, Prague slowly loses its attractiveness for investors because of the bad conditions for running a business, high level of a corruption and the unwillingness of the state offices to support investors' efforts.

5.1.3 Prague real estate market

Prague real estate market (both residential and commercial) was strongly affected by restitution and privatization. Former communist regime made very imprecise records about the nationalized property, therefore it was complicated to determine who is the rightful owner. Two common swindles are connected with the restitution - one from politicians, second from individuals. Politician often sold the property of the municipalities to someone under the market price. The rightful owner of the property can sue the municipality. If the owner is able to give an evidence that he is truly the legitimate owner, state will cancel all the past contracts and the true owner will be compensated, but hardly ever the money covered the opportunity costs. The other fraud is based on creating fake documents which is connected with bribery. After making the fake documents and restituting of some property, the property is immediately sold to someone else. The legitimate owner can sue these contracts, cancel them and has a right to be compensated.

The Czech Republic also decided to privatize significant amount of houses (that can serve as an office or retail space) and flats for liquidity and economically favorable reasons. The privatization was also motivated by municipalities that had to get money to reconstruct their property. So they were willing to sell part of it to get funds to invest into the buildings that were planned to bring profits in the future. Many wealthy investors used

the privatization to build their real estate portfolio under for them very convenient conditions.

Later in mid-nineties, the large-scale restitution and privatization brought other problem. The new owners tried to sell their property and make some money. The problem was insufficient demand for the real estate. Czech inhabitants had no money to invest after the forty years of totalitarian regime and foreign investor were still too afraid of the post-soviet economy. Low demand pushed the prices of the real estate down.

The market of the commercial real estate started to develop no sooner than in late nineties. The reason was the unattractiveness of the Czech Republic to investors that were very skeptical and unwilling to invest in the developing countries. First office parks were built in 2000. Between years 2000 and 2006, the situation on the commercial property market was stabilizing. The boom came in 2007 when the new supply almost doubled. Since the investors are very sensitive to financial crisis, many new projects were stopped after 2008 and development on the office market was practically none.

Situation nowadays (April 2013) is slowly improving. New projects were introduced, take-up is relatively strong and rents keep their past values. Even though the gross take-up is getting better, the vacancy rate is remaining very high (the current value is 13,07 %). The prognoses are rather optimistic. In 2013, the real estate market should be stably growing and more significant growth is expected not before 2014.

5.2 Budapest

5.2.1 Brief Description

Budapest is the capital and the largest city of Hungary. It is also the largest city in East-Central Europe. It is Hungarian commercial, industrial and transportation centre. Almost twenty percent of Hungarian population lives there⁵. River Danube flows through the city and the city Budapest occupies both banks. It is often considered as a financial hub in Central Europe and was ranked as a top city on Emerging Markets index (Mastercard, 2008).

5.2.2 Importance for the country

The importance of Budapest for the Hungary is enormous. First of all, it is far the most populated city, it is almost ten times bigger than Debrecen (second largest city). Not only Budapest is of a key importance today, it always has been playing this role back in history. It has ideal location in the centre of the country and it is not far away from other major cities in Europe - Wien and Bratislava. These all facts make Budapest the only interesting city in Hungary for investors to develop commercial real estate.

5.2.3 Budapest real estate market

Budapest real estate market had to deal right after the revolution (1993) with massive privatizations that played a decisive role in the forming of the market. Council homes were forced to be assigned to private owners. The majority of these privatized homes are occupied by low-income families that have no money to renovate the buildings which result in a poor quality of housing in Budapest. In other cases, flats were bought by investors who made a considerably large portfolio of residential property.

In later years, Budapest was exploring a new wave of construction during that many shopping malls, modern office buildings and high quality houses

⁵ 1.741.041 according to Hungarian Central Statistical Office in 2013

were built. Still in late nineties, Budapest was considered rather risky by investor, even though Budapest real estate market was able show two-digit profits. In the beginning of 21st century, housing market boom was noticeable which was caused by subsidies for housing from the government. This subsidized housing system kept mortgages very low and widely available. That led to huge construction activity. In 2003, the government stopped the subsidy program which caused many troubles to developers, banks and debtors. Hungary was hardly hit with the recession which was caused by the heavy dependence on the foreign capital to finance its economy. This has led to the one of the biggest public debts in the EU. The residential market turned into a bubble. The prices of the houses dropped about 15% during a year (according to Hungarian Central Bank).

Despite the crisis on residential market, commercial market was performing surprisingly well. Commercial real estate showed every sign of a bubble that had to burst sooner or later. That happened in 2008 after Lehman Brothers went bankrupt. That had dramatic effect on the situation on property investment market: prime yields immediately rose from 6 to 9% and liquidity dried up. This problem is persisting till nowadays. Moreover, Forex loans were banned for Hungarian inhabitants in 2010 which made acquiring a loan even harder (Bloomberg 2013).

Current situation on the commercial real estate market is tragic. It is forecasted that only one small building is going to be build in Budapest in 2013. That means that the volume of new supply will reach the historic lowest level. The demand for the real estate is only driven by renewals and renegotiations.

5.3 Moscow

5.3.1 Brief description

Moscow is the capital and the most populous city in Russia. It has also the most inhabitants among the cities in the whole Europe. The city is a major political, economic, cultural and scientific center of Russia. Moscow is situated on the Moskva River in the Central Federal District of European Russia.

5.3.2 Importance for the country

Moscow became the capital city of Russian Federation in 1918 after the Russian Revolution. Since then, it is political centre. Soon after, Moscow was getting also commercial and economic influence. Nowadays, Moscow has the largest community of billionaires in the world (Forbes, 2011). Since the city has so many wealthy inhabitants, it has become also an attractive city for Russian and foreign investors, especially those who offer services for rich customers.

5.3.3 Moscow real estate market

Whole Russia was relatively closed to foreign investments and influence in 20th century. The situation began to change slowly after 2000 when many economic reforms were introduced. Even though Russian opened to global investors, still more than 75% of rental agreements were signed by Russian firms.

After year 2000, Moscow was experiencing huge development. More than 4 millions square meters of modern shopping facilities were built, the total stock of offices had more than tripled. This development was pushed by massive demand for A and B class offices, which made up around 94% of all office rental demand. The insufficient number of good-quality office

spaces increased the rental level enormously high. The prime rents were approximately 5 times bigger than in comparable cities.

The Moscow commercial real estate market was hardly influenced by the global financial crisis. The prime rents dropped to the half amounts, vacancy rate rocketed to the 20%. The crisis ended "crazy" boom in Moscow when many low-quality buildings were built and rented for unreasonable price. The commercial real estate development from 2008 is much more rational, only truly A class building are built there mostly by professional foreign developers. The prime rents and vacancy rate are starting to stabilize.

Many new projects are planned to be built in Moscow in 2013. More than 1 million square meters is to be completed this year. Analysts believe that the demand for A and B class building will not decrease in consecutive 3 years.

5.4 Istanbul

5.4.1 Brief description

Istanbul is located in Turkey and spreads on two continents - Europe and Asia. It is the largest city in Turkey and more importantly the largest urban agglomeration in Europe. It has significantly more than 10 million people⁶. Its significance from antique ages till nowadays was given by its unique location around the only sea route between the Black sea and the Mediterranean. It is also absolutely necessary railway knot that connects the Europe to the Middle East. In the 2010, Istanbul was named a European Capital of Culture with annual 7 million visitors which put Istanbul to the tenth-most-popular tourist destination. Turkey makes also very important connection on a diplomatic level between European Union and Islamic

⁶ 13.854.740 population according to Turkish Statistical Institute in 2012.

countries because Turkey (and especially Istanbul) is known to have restrained Muslims in comparison to other countries in Middle East (Syria, Iraq, Saudi Arabia etc.).

5.4.2 Importance for the country

Why the city is so important for the country, was already indicated in previous part. First of all, it is the biggest city in Turkey. Despite the fact that it is not the capital city of Turkey, no other city can compete in financial situation and number of investing opportunities with Istanbul. The attractiveness for the investors can be caused by its unique location and the fact that it actually lies in Europe, which at least subjectively decrease the risk and worries from Middle East. Also banks are more willing to support investing efforts in this region.

5.4.3 Istanbul real estate market

Earlier, Istanbul's property market was formed by necessities of providing cheap housing for rapidly growing situation. In late nineties, new Turkish government introduced laws that enable foreigners to buy land in Turkey. Since the Istanbul has always been an attractive location, this change in legal system rapidly increased the interest of European investors. The investors focus mostly on exclusive areas in the centre of Istanbul. As a result, prices are rising rapidly. Istanbul is located in the earthquake zone. This situation complicates the construction of buildings and makes them more expensive. Due to the fact that whole Turkey is an earthquake zone, the government started biggest urban regeneration project to demolish 6,5 million buildings which also give investors new space to develop.

If we take a look on the commercial real estate data, we immediately see that gross quarterly take-up rose significantly from 2007 (see Figure 8.3.). In the end of the 2007, about 30.000 square meter of office space was let in contrast with the situation in 2012 where almost 200.000 square meter

where leased. The total volume shows logically the same trend. Total stock of offices had doubled in last 5 years. Prime office yields rose till the end of 2009 when the crisis came, then they slightly decreased to 7% where they stabilized. The vacancy rate fluctuated in last 4 year but still it keeps very low values. The prime rents grew to 25 Euros/sq m/month in last month which indicates the increasing land prices in prime locations with good accessibility. The prime rents are higher comparing them to the prices in other European cities (20% more expensive). These two facts suggest that demand for good-quality office spaces is still strong.

Istanbul municipality tries to find new location with good accessibility therefore they introduced two new projects that should solve this situation - new airport and third bridge over the Bosphorus. We think that Istanbul's real estate market will keep its pace and achieve a notable share in the investment market, because both occupier and investor demand is very strong.

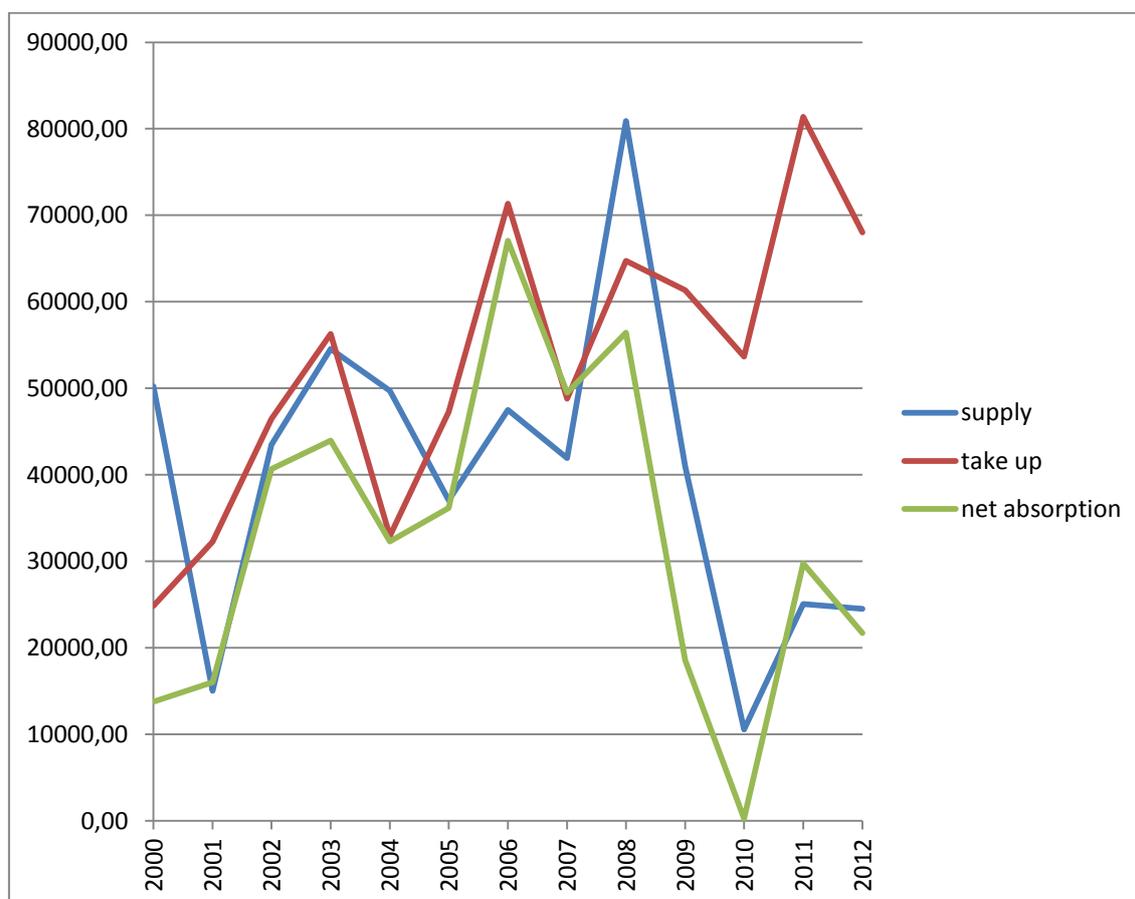
6 Methodology

6.1 Data issues

The data are mostly non-stationary which is not surprising at all because many indicators from financial world show this pattern. So there was quite a big suspicion that real-estate data will suffer from same problem. Data also show signs of unit-root processes. Unit-root is easy to remove by first-differentiating. This is in fact very powerful tool to weaken non-stationarity (Woolridge, 2009). The data still show sign of non-stationarity but this level is already acceptable for our purposes (for tests see Appendix). We also tested the data for autocorrelation. Some of them show signs of autocorrelation. To remove the autocorrelation, we employed Prais-Winsten estimation. This procedure takes care of the serial correlation of type AR(1) and gives us efficient estimator. We therefore believe that the spurious regression will not occur.

We also need to avoid multicollinearity. We have done correlation matrix among all the variables and found out that net absorption is almost perfectly correlated with gross take-up and new supply. We can easily see this relationship on graph (see figure 6.1.). This is not surprising because of the mutual relationship between each other.

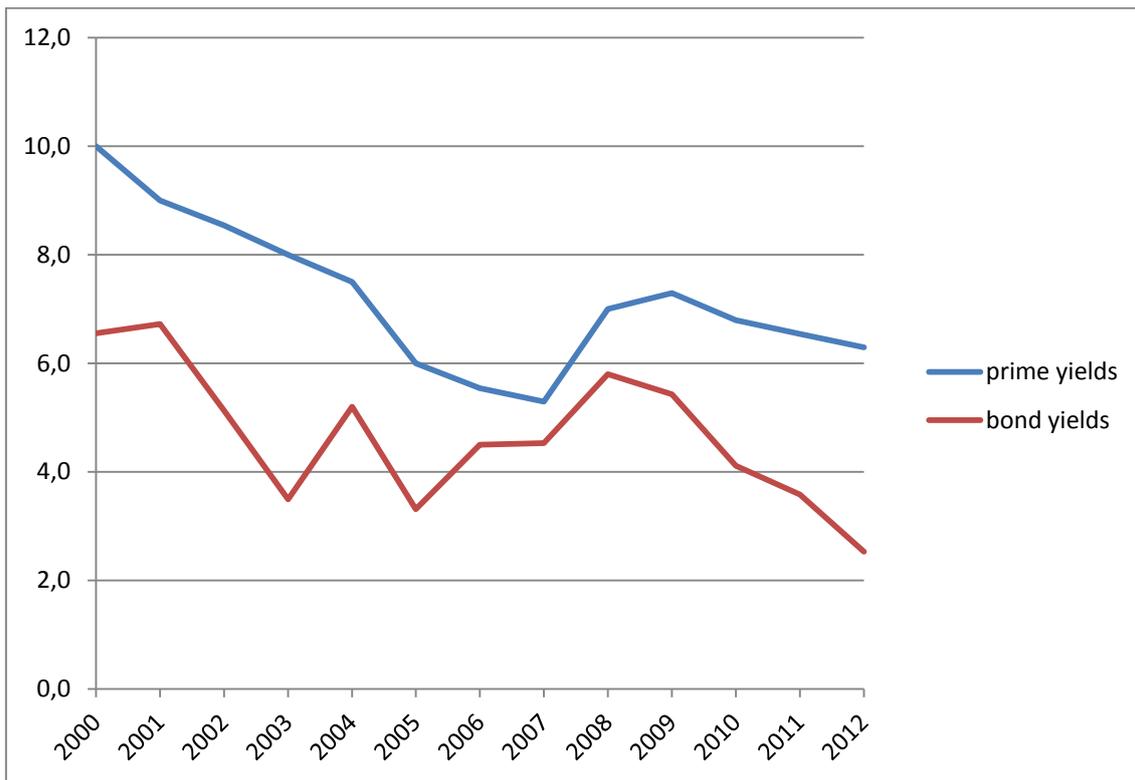
Figure 6. 1: New supply, gross take-up and net absorption in Prague, 2000-2012 (m²)



Source: Author

To avoid multicollinearity, we will not use these three variables at once in the regression. We also assumed co-movement of prime yields and 10 years Treasury bond yields. We can see on the graph below that they do move in the same direction, only the bond yields are more volatile. When we statistically tested their relation, it turned out that bond yields explain more than 50 % of prime yields. Therefore it does not make much sense to add bond yields to the regression. We did not find any other variables that are strongly correlated with each other, so we think we should avoid multicollinearity problems.

Figure 6. 2: Prime yields and 10 years bond yields, 2000-2012 (%)



Source: Author

6.2 Time-series

Many academicians use for residential real estate analysis VAR or VECM methods. VAR and VECM methods have less restrictive assumptions, they do not obviate the identification problem but they eliminate the linear algebra because of nonlinear structure. Although VAR methods can be sometimes more proper for our case, we decided not to use them and use time-series OLS, because we think VAR or VECM method would have not brought us many advantages. VAR and VECM methods are a-theoretical because they do not come from any before known economical theory. Perhaps the biggest disadvantage is the number of parameters that has to be estimated. New variable in the model significantly increases the number of parameters. These methods usually set upper limit for set of variables (usually six) and we would like to add more of them to regression. This problem can be handled with adding exogenous variables (not only

endogenous) but still it is a serious complication. We would also have to set longer lag length with this method which can be inappropriate due to the lack of data we have. Another problem of VAR and VECM methods is its rather complicated interpretation. We usually cannot interpret the result in a common way because of the amount of estimated coefficients. Therefore we would have to use the impulse response analysis and the forecast variance decomposition to interpret the results (Brooks, 2008).

There can also be some problems connected with the OLS estimation - serial correlation, endogeneity and multicollinearity. We believe that we did enough measures to avoid these problems.

We will use prime yields as a dependent variable and try to use as much explanatory variables as it makes sense.

6.3 Panel data

In the panel data analysis we wanted to employ random effect estimators as suggested before (Lieser and Groh, 2011). This methodology uses composite error term that is serially correlated across time as a part of it is present in each time period. The biggest advantage of this method is that it allows explanatory variables that are constant over time. We used Hausman test to confirm our assumption. Surprisingly enough, Hausman test reject the null hypothesis, that both fixed and random effects estimators are consistent (see Appendix). Therefore we will estimate the panel data with fixed effects.

We could use only some of the data to the panel regression. All data must be collected with same methodology and be in the same units (currency, square meter). Therefore we could use all commercial real estate data (from Jones Lang LaSalle) and unemployment rate. CPI (or inflation) and GDP are either calculated differently or the base year is set to another year.

7 Results and interpretation

In this part, we will describe the models we made, show the results and also briefly comment on them. We have to be very careful about implications we make because OLS estimation does not help with identifying the direction of the implication.

7.1 Prague

We made time-series regression. We chose the prime yields as a dependent variable because we are interested in finding out what increases profits from office real estate.

Table 1: Prague

Model No.	(1)	
Prime yields	Coefficients	t statistics
total stock	9,68E-06	7,85***
vacancy rate	0,12	4,07***
gross take-up	5,01E-06	1,77*
prime rents	0,0385	1,88*
<i>time</i>	<i>0,00472</i>	<i>1,27</i>
<i>CPI</i>	<i>0,001</i>	<i>0,20</i>
unemployment rate	-1,113	-2,83***
<i>GDP growth</i>	<i>-0,141</i>	<i>-0,81</i>
<i>total number of houses</i>	<i>-8,37E-08</i>	<i>-0,07</i>
<i>cost-index of dwelling construction</i>	<i>0,000022</i>	<i>0,20</i>
constant	-0,372	-2,59***
Observations	48	
Adjusted R-squared	0,682	
DW	1,672	

Insignificant variables are in italics,

Significant variables are bold

*p<0,10 , **p<0,05 , ***p<0,01

Source: Author

We were able to collect high-quality data from the commercial real estate agency that not only included the typical statistics but also net absorption (we did not add net absorption to the model to avoid multicollinearity). The Czech Republic has very good statistical office therefore it was not complicated to acquire both financial and residential data.

We achieved to make very good model whose explanatory variables explain almost 70% of the dependent variable. When we look briefly at the model, we can see that all typical variables (vacancy rate, gross take-up, rents and gross take-up) proved to be significant. The model shows that if the vacancy rate increases about one percentage point, prime yields will grow about 0,12 %. This relation is very strange at first. Higher vacancy rate means smaller number of tenants. Lower income from tenants then must negatively influence prime yields. This hypothesis would be probably right in most cases, where vacancy rate is below 90 percent. Well, the model indicates opposite correlation. We believe that higher vacancy rate increases prime yields when building is occupied from 90 percent and more. This can be explained in the following way: those 10 % floorspace usually consists of small pieces on every floor that is either impossible to rent or can be rented to the small companies. We once again remind that we the data are talking about prime offices (the best available). Small companies usually do not have so many free funds to afford it. Moreover, the owners of the building often let the small spaces unoccupied just in case that major tenant would like to enlarge his leased floorspace. Also to rearrange the inner space for smaller tenants can be very costly. In other words it is not convenient for owner to achieve zero vacancy rates at all costs.

The total stock of the office was also statistically significant. The correlation is positive which makes perfect sense. If the total space of the

office park (or in other words if the new supply) increases about 100.000 square meters, the prime yields will grow about 1 %. The gross take-up is also very important determinant of the prime yields. It shows same sign as the dependent variable. That supports our assumption. When comparing the coefficients of the take-up and the total stock, we can see that the coefficient of gross take-up is about 5 times bigger. This confirms that only constructing an office building is not enough. More important is to find an appropriate tenant and lease it.

The prime rents do not play very important role. Our model suggest that one Euro rise of prime rents increases prime yields about 0,04% which is negligible amount.

When we look at the financial and labor statistics, we have to say that neither CPI nor GDP were significant. Only unemployment rate proved to be significant. It shows negative signs, which we find reasonable. If unemployment rate grows, less people will attend their jobs, more vacant will the offices be. This motivates the tenants to decrease the amount of the square meter they hired. This decreases gross take-up which logically leads to decrease in the prime yields.

Unfortunately no residential real estate statistics proved to be significant.

7.2 Budapest

We made time-series regression for Budapest and chose the prime yields as dependent variable.

Table 2: Budapest

Model No.	(2)	
Prime yields	Coefficients	t statistics
<i>total stock</i>	1,36E-08	0,71
vacancy rate	-0,08	-1,97*
gross take-up	1,08E-06	1,65*
prime rents	0,001	1,73*
<i>time</i>	0,00005	0,76
<i>CPI</i>	-0,001	-0,98
<i>unemployment rate</i>	-0,0011	-0,31
<i>GDP growth</i>	1,12E-01	0,01
<i>total number of houses</i>	4,42E-07	0,86
<i>cost-index of dwelling construction</i>	0,0003	0,39
<i>constant</i>	-0,0022	-0,79
Observations	51	
Adjusted R-squared	0,346	
DW	2,3	

Insignificant variables are in italics

Significant variables are bold

*p<0,10 , **p<0,05 , ***p<0,01

Source: Author

First of all, we would like mention that we succeeded to collect long data on Budapest real estate market from more areas. This is given by the quality of Hungarian Central Statistical Office and the duration of being Jones Lang LaSalle on the Hungarian market. Despite the good quality of data, the model is not very precise. Only three dependent variables were significant.

When we look at the table, we can see that the total stock of commercial floorspace proved to be insignificant. Gross office take-up was significant.

The magnitude is relatively big when we take in account, that usual amounts of gross take-up in Budapest were approximately 50.000 m² (before 2008). That means that gross take-up was regularly increasing 0,1 percentage point of prime yields every three months. Relationship of vacancy rate to prime yields is statistically confirmed. The way they influence each other is: higher vacancy rate makes prime yields to decrease. In Budapest, this relationship was negatively correlated as we did assume. Prime rents were still significant. Rents and prime yields are positively correlated (which is only logical) but the magnitude is surprisingly small (in fact equal to zero). That from our point of view means that cost of the rents does not affect the prime yields at all. We explain this by the relationship between vacancy rate and rents. If we increase the rents, most likely we will have higher vacancy rate⁷. This only results in no change in the prime yields.

We also tested the prime yields on other financial statistics - GDP, CPI and unemployment rate. Unfortunately, none of them proved to be significant. Finally, we tested prime yields on some variable from residential segment. Number of flats was insignificant. We expected that because we found the correlation between residential and commercial sector unlikely. We also tested the relationship between the prime yields and the cost-index of dwelling construction. This index says how expensive it is to build a house. In other words, it nicely shows the trends of construction professions prices. Therefore it has to influence not only the residential market but commercial too. Even though we supposed that the model will confirm our hypothesis, cost-index was insignificant.

⁷ We tested this relationship and it is positive and statistically significant.

7.3 Moscow

We constructed time-series model for Moscow with the dependent variable prime yields.

Table 3: Moscow

Model No. (3)		
Prime yields		
	Coefficients	t statistics
total stock	1,58E-06	2,06**
vacancy rate	-0,255	-1,94*
gross take-up	1,16E-05	1,88*
<i>prime rents</i>	0,132	0,27
<i>time</i>	0,0097	0,96
CPI	0,3832	4,57***
unemployment rate	2,214	2,43**
GDP growth	-0,158	-2,61**
constant	-2,267	-5,20***
Observations	40	
Adjusted R-squared	0,48	
DW	1,936	

Insignificant variables are in italics

Significant variables are bold

* $p < 0,10$, ** $p < 0,05$, *** $p < 0,01$

Source: Author

We had many troubles to acquire data from Moscow region. The data are shorter in comparison to Prague and Budapest (2003 - 2012) and were usually collected on yearly basis. We had to adjust considerable part of the data to the quarterly form. Despite the difficulties we were having, the model turned out to be very good and showed many significant variables.

All commercial real estate variables fulfill our assumption. An increase in total stock will increase the prime yields. A decrease in the vacancy rate also increases the prime yields and gross take-up is positively correlated with prime yields too. Prime rents were not statistically significant.

Interestingly enough, all our chosen financial and labor variables were significant. Growth of inflation strongly affects the prime yields. We explain this relationship with the effect of inflation to loans. It is clear that inflation decreases the real value of debt. When the debt is getting smaller because of the inflation, also the construction cost are smaller (office building are mostly financed with the loans from banks). The rents will not be affected by the inflation because they are usually adjusted according to the inflation every year. Unemployment rate was once again negatively correlated to prime yields but the coefficient was very high this time. Growth of the GDP (adjusted of inflation) has negative sign. That means that the prime yields are falling when the economy is accelerating.

7.4 Istanbul

Table 4: Istanbul

Model No. (4)		
Prime yields		
	Coefficients	t statistics
total stock	-2,31E-08	-1,72*
vacancy rate	0,048	1,84*
gross take-up	1,08E-07	5,12***
<i>time</i>	-2,00E-04	-6,82***
<i>CPI</i>	-0,0087	-0,54
unemployment rate	-1,36E-03	-1,75*
<i>GDP growth</i>	-0,0064	-1,36
constant	0,0025	4,33
Observations	24	
Adjusted R-squared	0,659	
DW	2,05	

Insignificant variables are in italics

Significant variables are bold

* $p < 0,10$, ** $p < 0,05$, *** $p < 0,01$

Source: Author

We made a time-series model for Istanbul and we chose the prime yields to be the dependent variable. The dataset of Istanbul is unfortunately very poor. Istanbul is a new market for real estate investors and that is why also real estate agents came to Istanbul in 2006. The model is very good even though we have only 24 observations.

The first interesting information in the model is the relation between the prime yields and the gross take-up. We can see it is positive which we had assumed. More rented space brings more income to the owner of the building. The magnitude is also very interesting. 100.000 square meter of newly rented spaces per 3 month will increase the prime yields about 0,1 percentage point. This correlation is not surprising and suggests the validity of our model. The vacancy rate is positively correlated with the prime yields. We analyzed this strange relationship in the part of Prague model. We therefore know it is possible.

The total stock was significant. The total stock has negative sign which can mean that there is very competitive environment in Istanbul and new supply of the office spaces will decrease the prime yields. We believe it is possible because Istanbul is brand new market for investors and prices have to stabilize at first.

We also added few financial and work force statistics. CPI did not play any role when considering the prime yields. Unemployment rate was significant which confirms the validity of this estimation by other models. We also wanted to use some residential statistics. We failed because Turkish Statistical Institute does not collect any information about housing except total number of flats / houses.

7.5 Panel Data

Table 5: Panel data regression

Model No. (5)		
group variable: city		
Prime yields	Coefficients	t statistics
<i>total stock</i>	-1,69E-07	-0,31
vacancy rate	0,074	1,64*
gross take-up	-1,94E-06	-1,82*
time	-1,13E-02	-2,51***
<i>unemployment rate</i>	-0,0211	-0,52
<i>constant</i>	0,1788	2,01
Observations	96	
groups	4	
Hausman test (p-value)	143,12 (0,001)	
R-squared - within	0,144	
R-squared - between	0,42	

Insignificant variables are in italics

Significant variables are bold

* $p < 0,10$, ** $p < 0,05$, *** $p < 0,01$

Source: Author

Finally, we conducted a panel data regression to confirm previously stated correlations. We also chose prime yields as a dependent variable. We could not use the prime rents from commercial real estate indicators, we also refused to use CPI and GDP. We also could have used only 24 observations from each city which considerably worsened our dataset and model too.

Only the vacancy rate and the gross take-up were found to be significant. The vacancy rate turned out to be negative. The vacancy rate was probably affected by high coefficient in the Moscow model therefore it remained negative. The gross take-up is naturally positively correlated with the prime yields.

8 Comparison of the cities

In this part, we would like to summarize our findings about each city. We will compare the results and explain why we think it is possible. We created new table where we summarized the results from the models in order to be able to compare them more easily. Blank space in the table means either the variable was insignificant or we were not able to collect the data. The variables that turned out to be significant in previous part can be called the determinants of commercial real estate. We will discuss the results of those determinants and compare them.

Table 6: Comparison

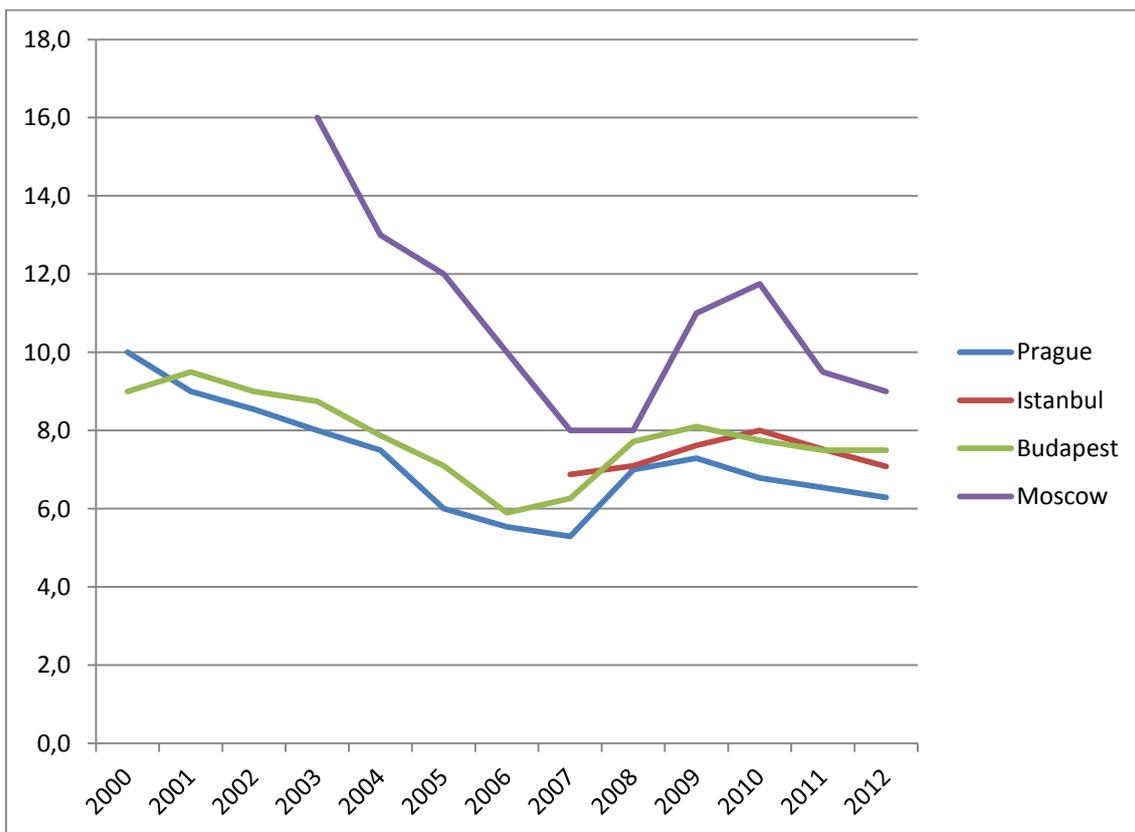
Model No.	(1)	(2)	(3)	(4)
Prime yields				
	Coefficients		Coefficients	
total stock	9,68E-06		1,58E-06	-2,31E-08
vacancy rate	0,12	-0,08	-0,255	0,048
gross take-up	5,01E-06	1,08E-06	1,16E-05	1,08E-07
prime rents	0,0385	0,001		
time				-2,00E-04
CPI			0,3832	
unemployment rate	-1,113		2,214	-1,36E-03
GDP growth			-0,158	
total number of houses				
cost-index of dwelling				
construction				
constant	-0,372		-2,267	
Observations	48	51	40	24
Adjusted R-squared	0,682	0,346	0,48	0,659
DW	1,672	2,3	1,936	2,05

Source: Author

8.1.1 Prime yields

When we take a look on the graph below, we can nicely see the development of the prime yields in every region. Prague and Budapest are similar and close cities and also the values of their prime yields move almost perfectly together. The values in Istanbul are very stable and now they copy 7% line. The development of the prime yields in Moscow is definitely most interesting. Firstly, the prime yields went fast to the 8% where they bounced off and they started growing. After global financial crisis in 2008, they immediately reacted with a sharp decline. The situation in 2012 is getting better and prime yields stabilized at 9%.

Figure 8. 1.: Prime yields in Prague, Budapest, Moscow and Istanbul, 2000-2012 (%)



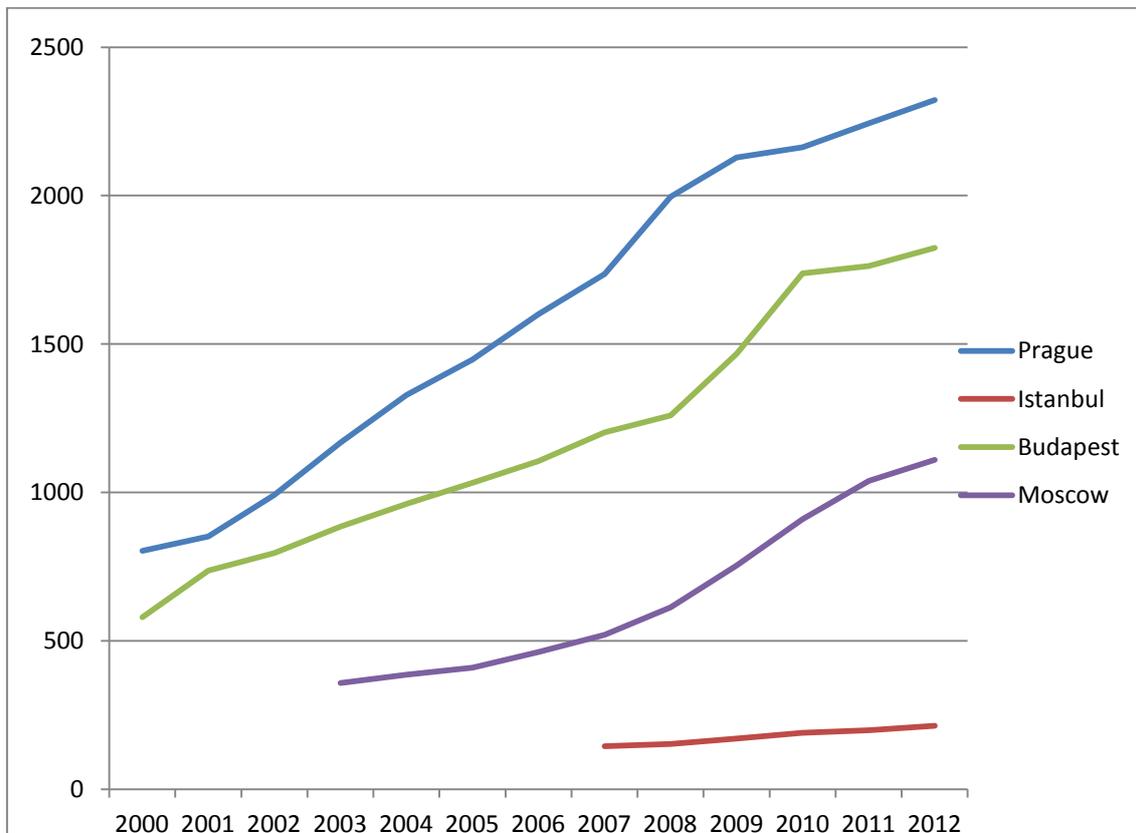
Source: Author

8.1.2 Total office stock

Total office stocks were significant in Prague, Moscow and Istanbul. In Prague and Moscow, the coefficient of total stock is positive and has similar value. But how it is possible that Istanbul has similar value but negative? We believe that the negative sign of total stock reflects the way how Istanbul handled the global financial crisis. There was no decrease in the new supply and the gross take-up in Istanbul after 2008. There was a huge drop of the new supply in Moscow and Prague therefore there is a strong demand for new office buildings now. On the contrary, the new supply in Istanbul was stable and that is why we believe that there is not such a strong demand.

In the graph below, we plotted the total office stock per 1000 inhabitants. We can see that Prague and Budapest have comparable values and the market there is well filled with the offices. Moscow is doing relatively fine but its values are half in comparison to Prague. We believe that Moscow will be very interesting city for investors at least for next 10 years. When we look at the situation in Istanbul, we can forecast optimistic future development because the supply of offices is incredibly low there.

Figure 8.2: Total office stock in Prague, Budapest, Moscow and Istanbul per 1.000 inhabitants, 2000-2012(m²)



Source: Author

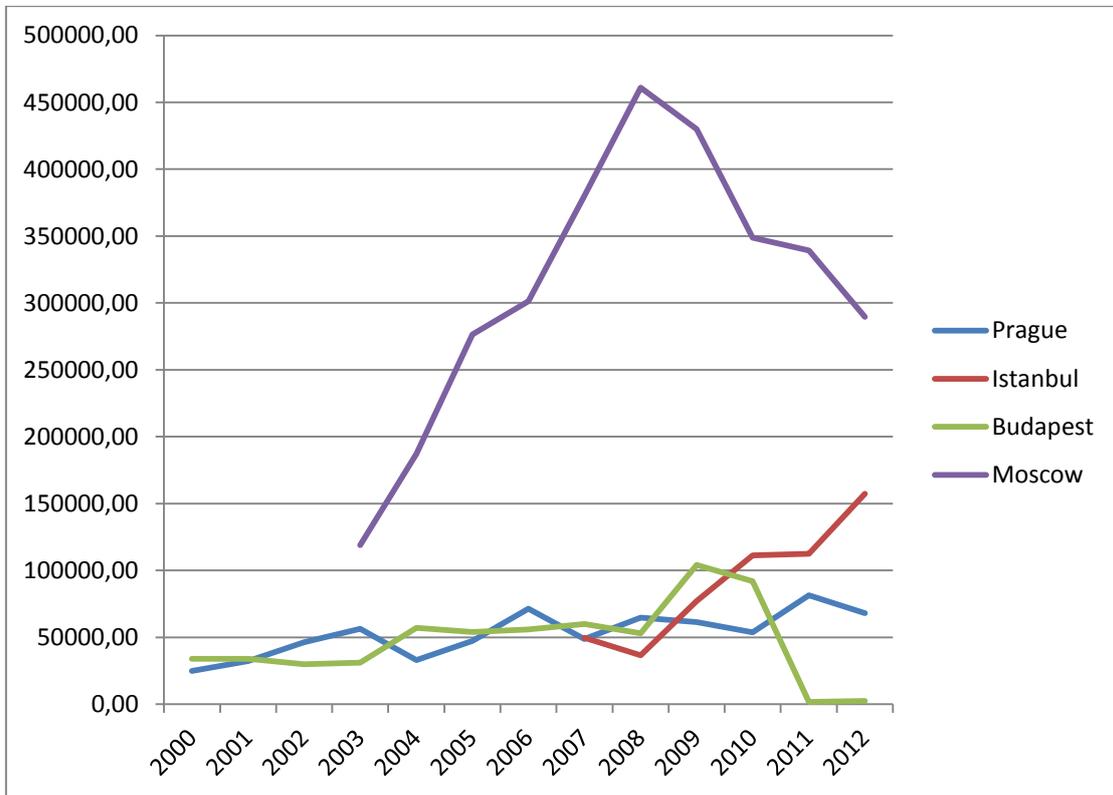
8.1.3 Gross take-up

The gross take-up was significant in all cities in which we made the regressions. Budapest and Prague are more sensitive to changes of the take-up because they are smaller, have fewer inhabitants and have also smaller total stock of offices. The coefficient by the gross take-up in Moscow and Istanbul is about ten times smaller partly due to incomparable amount of total stock and size of the city.

The graph for the gross take-up is very interesting. Prague keeps stable values. That is given not by new contracts but only renewed ones. Budapest is currently almost at zero values. Istanbul went unaffected from the financial crisis and the gross take-up keeps its growing trend. Moscow

take-up is continuously going down but the amount of signed contracts is still very high.

Figure 8. 3.: Gross take-up in Prague, Budapest, Moscow and Istanbul, 2000-2012(m²)



Source: Author

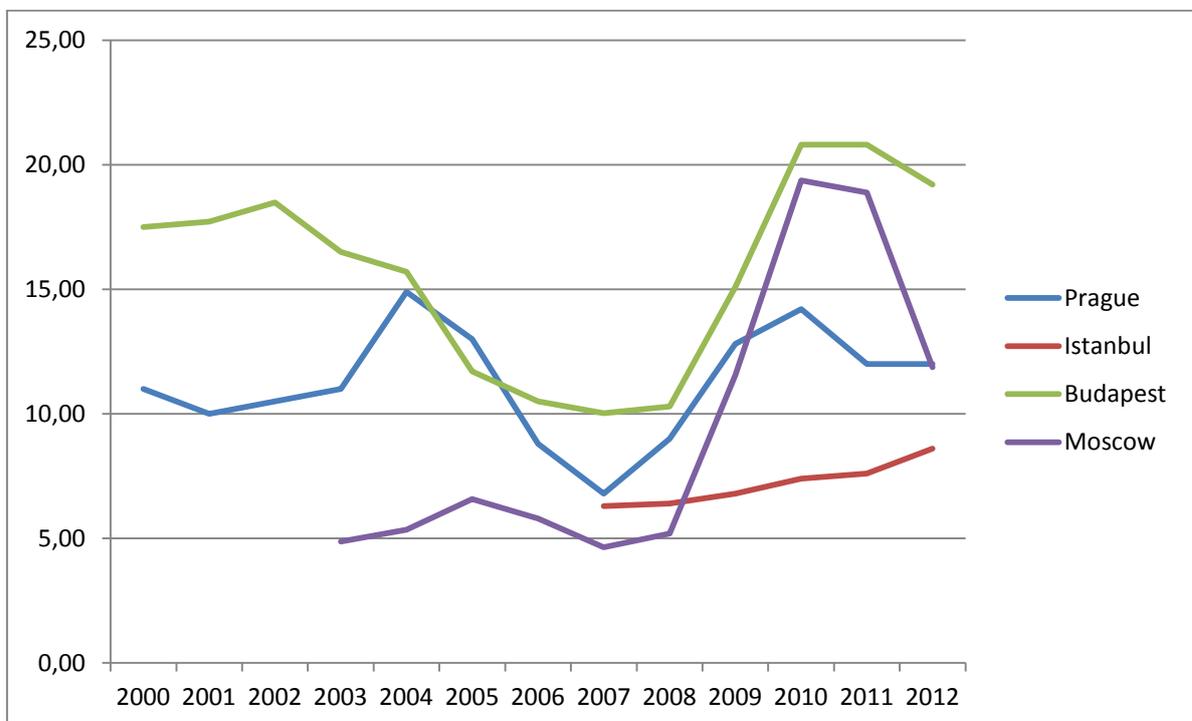
8.1.4 Vacancy rate

According to our model, the vacancy rate shows rather surprising values. We can divide the results to two categories: negative and positive coefficients. Budapest and Moscow belong to the category with negative coefficients. This corresponds to basic thinking. Lower vacancy rate means more occupied buildings which naturally increases prime yields. So why do Prague and Istanbul have positive coefficient by vacancy rate?

When we look at the graph we can easily see that both Prague and Istanbul have lower vacancy rate than Budapest and Moscow. We already explained why it is not convenient to try to have fully occupied office building no

matter what (see interpretation of Prague model). We said that efforts to fully occupy the building when we are dealing with the vacancy rate about 10 percent are counterproductive because filling the rest spaces brings additional costs or owners leave the spaces unoccupied on purpose (in case that any current tenant would like to expand his floorspace). On the other hand, Budapest and Moscow used to have vacancy rate about 20 percent. Under these circumstances it already makes sense (economically) to put some effort to find new tenants and decrease the vacancy rate.

Figure 8. 4.: Vacancy rate in Prague, Budapest, Moscow and Istanbul, 2000-2012(%)



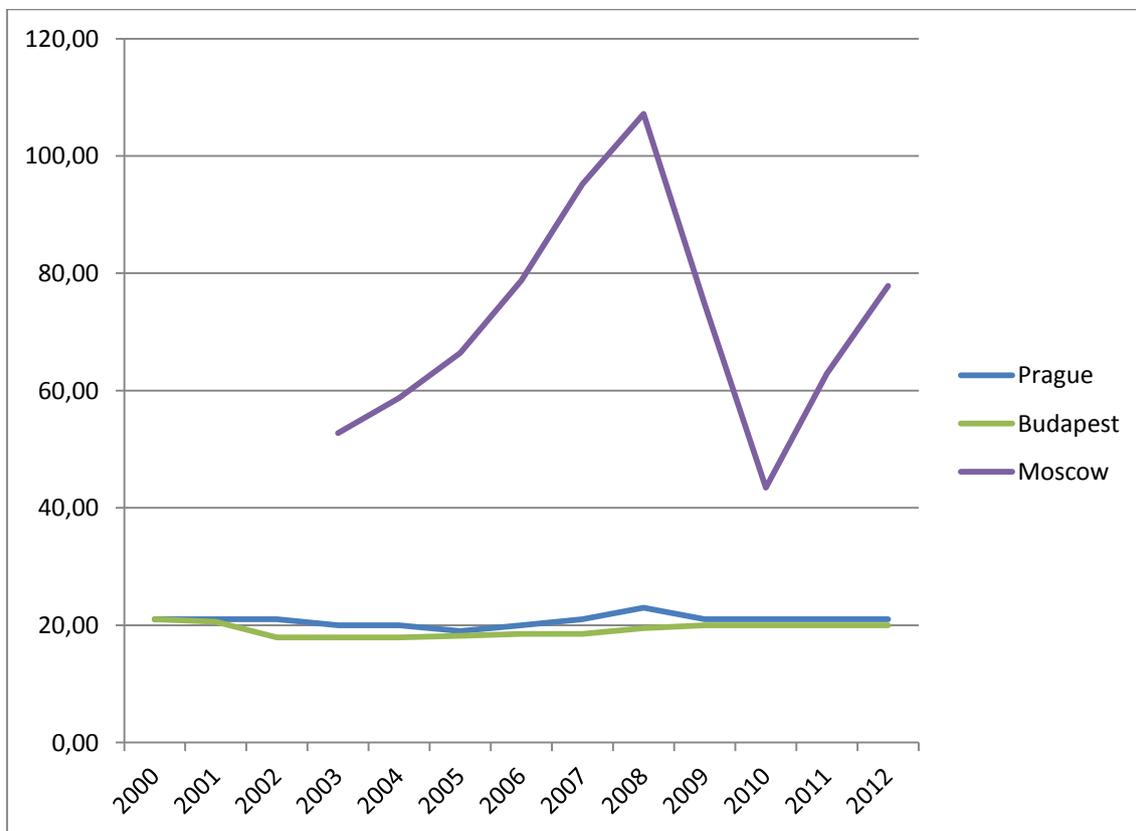
Source: Author

8.1.5 Prime rents

We collected data to the prime rents only in Prague, Budapest and Moscow. Prime rents proved to be significant only in Prague and Budapest but they both have coefficients very close to zero. Because of the small impact on the prime yields, we do not think that the prime rents are the determinant of the office real estate.

From the graph, we can easily see why. Rents stay relatively stable in time because contracts of office leases are usually for five years (sometimes even for 10 years). Moscow rents show interesting development, rents dropped about 60 % after crisis in 2008. From 2010 to the spring 2013, prime rents are increasing again but they show some signs of stabilization on current level (80 EUR/month and m²) and analysts forecast to stay at this level at least in year 2013.

Figure 8. 5.: Prime rents in Prague, Budapest and Moscow, 2000-2012 (EUR/month.m²)



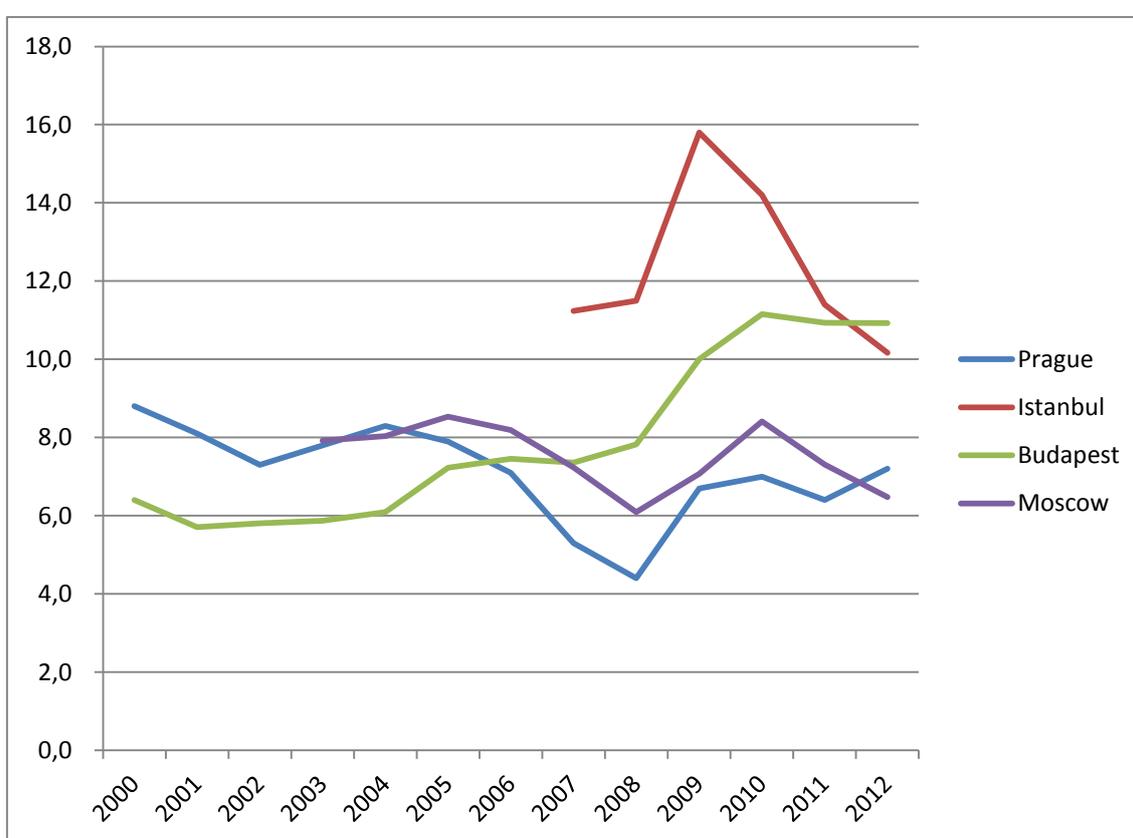
Source: Author

8.1.6 Unemployment rate

Unemployment rate is the only commonly used macroeconomic indicator that turned out to be significant. It always had negative sign and high value of coefficient. Even though the value can seem extreme, it is actually very

unlikely that unemployment rate would change about more than 2 percentage points within a year. When we look at the data, we will find out that unemployment rate changed at most about 5 percentage in 12 years. Unemployment rate is relatively stable in all cities because of the governmental procurements. Therefore we cannot expect any considerable jump that would seriously affect the prime yields.

Figure 8. 6: Unemployment rate in Prague, Budapest, Istanbul and Moscow, 2000-2012 (%)



Source: Author

9 Conclusion

In this thesis, we introduced the commercial real estate indicators and carefully explained them. We created an abstract of the historic development of commercial real estate market in Prague, Budapest, Istanbul and Moscow. Finally, we estimated 4 OLS models of four major cities in Central and Eastern Europe and one panel data model of all four of them. We wanted to examine commercial real estate market behavior and to investigate existence of relationship between the prime yields and other either macroeconomic or real estate indicators. We used total office stock, prime rents, gross take-up and vacancy rate as main real estate indicators and CPI, GDP, unemployment rate as main macroeconomic ones. In order to be able to estimate the models, we created data sheet with all the previously mentioned variables. We estimated the model on data from period 2000-2012 that means including financial crisis.

From the results of the models, we conclude that main determinants of commercial real estate are total office stock, gross take-up, vacancy rate and unemployment rate. The total office stock and the gross take-up usually positively influence the prime yields. Situation with vacancy rate is much more complicated, the direction of dependence on prime yields can be only decided according to the value of vacancy rate. Unemployment rate is negatively correlated with prime yields.

The models and data sheet enabled us to compare the results of all cities among the cities and to conclude what the future development of commercial real estate indicators will be.

Except for the above mentioned results, our contribution to the real estate topic is creation of the data sheet. Even though it is not perfect and relatively short, our dataset can be useful when examining the commercial

property market. As for future research, we recommend to update this data sheet, enlarge it with data from other cities and use more advanced method to observe how the commercial real estate market recovered from the global financial crisis.

10 Bibliography

Bloomberg. (2012). Hungarian Market collapse. [online]

<http://www.bloomberg.com/news/2012-03-25/hungarian-market-collapses-after-forex-loans-debacle-mortgages.html> (accessed on 10.5.2013).

Breusch, T. and Pagan, A., 1980. The LM Test and Its Application to Model Specification in Econometrics. *Review of Economic Studies*, 47, pp. 239-254.

Case B., Goetzmann W. N. and Rouwenhorst G., 2000. *Global Real Estate Markets - Cycles and Fundamentals*. National Bureau of Economic Research, Inc., NBER Working Paper No. 7566.

ECB, 2013. *Financial stability review*. [online]

<http://www.ecb.europa.eu/pub/fsr/html/index.en.html> (accessed on 12.5.2013).

Égert, B. and Mihaljek, D., 2007: *Determinants of house prices in central and eastern Europe*. Bank for International Settlements, BIS Working Papers No. 236.

Greene, W. H., 2003, *Econometric Analysis*, 5th edition, Prentice Hall, New Jersey.

Gyourko J., 2009. *Understanding Commercial Real Estate: Just How Different from Housing Is It?* National Bureau of Economic Research, Inc. NBER Working Papers No. 14708.

Hausman, J. A. , 1978. Specification Tests in Econometrics, *Econometrica*, 46(6).

Higgins, D.M., 2000. *The determinants of commercial property market performance*. Faculty of Business, University of Technology, Sydney.

Hilbers, P. L. C., Lei, Q., Zacho, L., 2001. *Real Estate Market Developments and Financial Sector Soundness*. International Monetary Fund, IMF Working Paper 01/129.

Hlaváček, M. and L. Komárek, 2009. Regional Analysis of Housing Price Bubbles and their Determinants in the Czech republic. *Czech Journal of Economic and Finance*, 61(7), pp. 67-91.

Lee, S., 2002. *The Risks of Investing in the Real Estate Markets of the Asian Region*, Department of Land Management, The University of Reading, Working Paper No. 6.

Lee, S., 2005. *Gauging the Investment Potential of International Real Estate Markets*, Real Estate and Planning, The University of Reading, Working Paper No. 19.

Lee, S., 2006. *The Impact of Country Risk on International Real Estate Returns*, Real Estate and Planning, The University of Reading, Working Paper No. 10.

Lieser, K. and Groh, A. P., 2011. *The Determinants of International Commercial Real Estate Investment*. IESE Business School, Working Paper No. 935.

Pagliari, J.L., Webb, R., Canter, T.A. and Lieblich, F., 1997. A Fundamental Comparison of International Real Estate Returns, *Journal of Real Estate Research*, 13(2), pp. 317-347.

Quan, D.C. and S. Titman, 1998. Commercial Real Estate Prices And Stock Market Returns: An International Analysis, *Financial Analyst Journal*, 53(3), pp. 21-34.

Resource. (2013). Twenty Years of Real Estate Market. [online]
<http://resourceinfo.hu/en/cikk/iroda/28709.html> (accessed on 18.4.2013).

Webb, B and O'Keefe, J., 2002. *The Case for Global Real Estate*, UBS Global Asset Management, Working paper.

Wooldridge, J. M., 2009. *Introductory econometrics: a modern approach*, MIT Press, Cambridge, Massachusetts, second edition 2009.

BLOOMBERG.COM

CBRE.EU

CHAMBERLAINEECONOMICS.COM

INVESTOPEDIA.COM

JONESLANGLASALLE.COM

FORBES.COM

11 Appendix

Table 7: DW statistics (original)

DW original	Prague	Budapest	Moscow	Istanbul
	1,438	1,625	1,904	1,86

Source: Author

Table 8: KPSS

Kwiatkowski, Phillips, Schmidt and Shin test for stationarity of a time series. H0: variable is trend stationary.

KPSS	Prague	Budapest	Moscow	Istanbul
lag 1	0,192	0,181	0,0201	0,0854
lag 2	0,143	0,156	0,0198	0,104
lag 3	0,119	0,128	0,0271	0,141
lag 4	0,107	0,112	0,0381	0,132
lag 5	0,100	0,104	0,0485	0,113

Source: Author

Critical values: 10%: 0,119, 5%: 0,146, 1%: 0,216

Table 9: Dickey - Fuller test

Dickey fuller	Prague	Budapest	Moscow	Istanbul
Test statistic	-3,238	-3,374	-6,569	-4,484
10%	-2,605	-2,601	-2,614	-2,630
5%	-2,941	-2,933	-2,964	-3,000
1%	-3,607	-3,587	-3,662	-3,750

Source: Author

Table 10: Breusch-Pagan test

Breusch-Pagan test	Prague	Budapest	Moscow	Istanbul
P-value	0,0432	0,0563	0,1778	0,843

Source: Author

In the Prague model, GDP suffers from heteroscedasticity.

Table 11: Hausman test

Hausman test	Panel data
Chi2	143,12
Prob>chi2	0,001

Source: Author

We reject the hypothesis that both estimations (random and fixed effects) are correct, therefore we use fixed effects estimation.